# Water Management Plan

United States Environmental Protection Agency
National Health and Environmental Effects Research Laboratory
Western Ecology Division

Pacific Coastal Ecology Branch
2111 SE Marine Science Drive
Newport, Oregon 97365

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EPA

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**NATIONAL HEALTH AND ENVIRONMENTAL RESEARCH LABORATORY**
**WESTERN ECOLOGY DIVISION**
**PACIFIC COASTAL ECOLOGY BRANCH**

# WATER MANAGEMENT PLAN

Approved by:

Jay Gile, Facilities Manager — 8-31-04 Date

Kathy McBride, Associate Director for Program Operations — 8/31/04 Date

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## 1.0 EPA'S STATEMENT OF PRINCIPLES ON EFFICIENT WATER USE

In order to meet the needs of existing and future populations and ensure that habitats and ecosystems are protected, the nation's water must be sustainable and renewable. Sound water resource management, which emphasizes careful, efficient use of water, is essential to achieve these objectives.

Efficient water use can have major environmental, public health, and economic benefits by helping to improve water quality, maintain aquatic ecosystems, and protect drinking water resources. As we face increasing risks to ecosystems and their biological integrity, the inextricable link between water quality and water quantity becomes more important. Water efficiency is one way of addressing water quality and quantity goals. The efficient use of water can prevent pollution by reducing wastewater flows, recycling process water, reclaiming wastewater, and using less energy.

EPA recognizes that regional, state, and local differences exist regarding water quality, quantity, and use. Differences in climate, geography, and local requirements influence the water-efficiency programs applicable to specific facilities. Therefore, EPA is establishing facility-specific Water Management Plans to promote the efficient use of water and meet the water conservation requirements under Executive Order 13123, Greening the Government Through Efficient Energy Management.

This Water Management Plan has been established to document and promote the efficient use of water at the National Health and Environmental Effects Research Laboratory, Western Ecology Division (WED) Laboratory in Newport, Oregon. The plan is organized according to the Federal Energy Management Program (FEMP) Facility Water Management Planning Guidelines under Executive Order 13123.

## 2.0 FACILITY DESCRIPTION

The WED Pacific Coastal Ecology Branch (PCEB) is housed in a state-of-the-art laboratory complex on the Hatfield Marine Science Center (HMSC) campus, situated on the shore of Yaquina Bay. The laboratory, owned and operated by EPA, was occupied in 1990 and is designed for marine and estuarine research. Wet labs are available for a variety of experiments, including tests with exotic species and chronic pollutant exposures. Analytical laboratory facilities provide for low-level analysis of organic pollutants, metals, and natural products. The complex includes laboratory and office facilities for PCEB, and a seawater pumping and storage system to supply both PCEB needs and those of the other non-EPA laboratories on the HMSC campus.

The WED Newport Laboratory complex occupies approximately 3.2 acres on the east side of the HMSC campus. The laboratory site is made up of approximately 1 acre of buildings, and 2 acres of grounds most of which is covered with natural vegetation. The main laboratory building has an inner courtyard of approximately 0.2 acres which is landscaped with native vegetation.

Buildings in the complex consist of the main laboratory building, the seawater reservoir, a highbay building for carpentry and boat repair, and the hazardous waste storage building. Collectively, the buildings contain 38,851 square feet of conditioned space, with the vast majority contained within the main laboratory building. The main laboratory building is divided into a laboratory wing that makes up about three-quarters of the facility, and an office wing that makes up the remainder.

## 3.0 FACILITY WATER MANAGEMENT GOALS

The water management goals of WED are achieved through the implementation of an Environmental Management System (EMS). The EMS is being established and implemented consistent with the laboratory environmental management policy. The WED environmental management policy statement is provided below.

**Environmental Management Policy**

The U.S. Environmental Protection Agency's Office of Research and Development (ORD) mission is to perform state-of-the-art research to identify, understand, and solve current and future environmental problems, provide responsive technical support to EPA's mission, integrate the work of ORD's scientific partners (other agencies, nations, private sector organizations, and academia), provide leadership in addressing emerging environmental issues, and advance the science and technology of risk assessment and risk management.

ORD continues to encourage and set an example of research and development activities which use effective EMSs that focus on regulatory compliance, pollution prevention, resource preservation, and public outreach. With this policy, the National Health and Environmental Effects Research Laboratory - Western Ecology Division joins other ORD sites in committing to implement EMS for our own employees, operations, and facilities. Collectively, ORD will become a leader in executing a model EMS within the Agency.

At WED, we commit to reduce the environmental impacts and consumption of natural resources from our facility operations and comply with all legal and applicable requirements. Our EMS will be designed to meet the following goals:

- Ensure compliance by meeting or exceeding all applicable environmental requirements while conducting research activities;
- Strive to continuously improve environmental performance;
- Integrate source reduction and other pollution prevention approaches into day-to-day research activities;
- Consider the environment when making all planning, purchasing, and operating decisions;

- Establish, track and review specific environmental performance goals and employee awareness; and

- Share performance information with our research partners and other interested parties.

**EMS Water Conservation Objectives**

WED has identified the reduction of water consumption as an objective of its draft EMS, which is currently in development. The following targets have been been established related to this objective:

- Consider water usage in addition to energy usage in the review of HVAC equipment for potential replacement.

- Maintain and promote water conservation awareness through e-mail and posting information.

## 4.0 UTILITY INFORMATION

**Contact Information**

Potable water supply and sewer service are provided by:

City of Newport
169 S.W. Coast Hwy
Newport, OR 97365

541-574-0616

**Rate Schedule**

Water supply is billed in two parts:
1) A water rate of $1.05 per 1,000 gallons used, plus
2) A monthly fee of $60.65, based on the facility's 4-inch supply meter.

Sewer service is also billed in two parts:
1) A sewer rate of $3.20 per 1,000 gallons of water used, plus
2) A monthly service fee of $9.80.

In addition, there is a monthly fire protection service fee of $7.00.

**Payment Office**

Research Triangle Park Finance Center (RTP-FC)

(Pouch and Regular Mail)
Environmental Protection Agency
Mail Code - D143-02
Research Triangle Park, NC 27711

(FEDEX)
Environmental Protection Agency
Mail Code - D143-02
4930 Page Road
Research Triangle Park, NC 27711

The fax number for RTP-FC is: 919-541-4975

## 5.0 FACILITY INFORMATION

The predominant features of the Newport Laboratory are the wet laboratory and mesocosm facilities where research is conducted on aquatic species and systems. These facilities are supplied with sea water from Yaquina Bay. The seawater system has an 800,000 gallon storage reservoir which is filled from two 10-inch diameter supply lines during a three hour pumping cycle twice each day at high tide, when high salinity ocean water is present at the intake location. The seawater system is used to supply water to the WED Newport Laboratory and other non-EPA research facilities on the HMSC campus.

The laboratory is equipped with two temperature controlled marine phytoplankton culture chambers, and four laboratories equipped with flow through seawater systems for culture and experimentation with marine invertebrate (e.g. amphipods and polychaete worms) and vertebrate (fishes) organisms. The experimental chambers can by supplied with both filtered and unfiltered seawater. The seawater also can be tempered with closed loop electric heat pumps.

Seawater used within the laboratory, free from contact with non-indigenous species or chemical contamination, is routed to the seawater drain and returned to the estuary. Seawater contaminated in any fashion by experiments is routed to storage tanks, analyzed, treated as necessary to remove or detoxify contaminants, and then discharged to the City of Newport wastewater treatment facility. Seawater is not the subject of this water management plan. Rather, the focus of this plan is potable water.

Potable water is obtained from the local water utility and used as process water in some of the laboratories (e.g., as source water for deionized water supply, glassware washing, sterilization), equipment cooling, and sanitary supply. On some experimental set-ups, potable water is also combined with seawater to adjust salinity. The facility is also equipped with an irrigation system

to water landscaped courtyards at the center and entrance to the main laboratory building. The remainder of this plan discusses potable water use throughout the facility.

**Major Water Using Processes**

Estimates of potable water consumption by major use area are provided in Table 1. These data reflect average facility water use between April 2003 and March 2004.

## Table 1
## Major Water Using Processes

| Major Process | Annual Consumption (gallons) | Percent of Total | Comments |
|---|---|---|---|
| Air compressor once-through cooling | 260,000 | 26.9 | Engineering estimate. This flow was significantly reduced in March 2004 |
| Sanitary | 250,000 | 25.9 | Engineering estimate |
| Irrigation | 100,000 | 10.4 | Engineering estimate |
| Boat washing | 50,000 | 5.2 | Engineering estimate |
| Dionized water | 23,000 | 2.4 | Engineering estimate |
| Reverse osmosis reject water | 49,000 | 5.1 | Based on measured ratio of reject to product water |
| Miscellaneous process and other laboratory water | 234,000 | 24.1 | Calculated as remaining difference from metered total |
| TOTAL | 966,000 | 100 | From monthly meter readings |

Additional detail on assumptions and calculations supporting these water use estimates are provided in Appendix A.

**Measurement Devices**

Incoming city water is metered. Metered usage is tracked monthly to monitor trends in water consumption.

**Shut-off Valves**

The city water shut-off valve is located in Mechanical Room S-112.

**Occupancy and Operating Schedules**

Approximately 40 employees work at the WED Newport Laboratory. The laboratory operates on a flex time schedule and is typically occupied between 7:00 a.m. and 5:30 p.m., Monday through Friday.

## 6.0 BEST MANAGEMENT PRACTICE SUMMARY AND STATUS

FEMP has identified Water Efficiency Improvement Best Management Practices (BMPs) in 10 possible areas. Implementation of BMPs in four or more areas are required under FEMP guidance. The WED Newport Laboratory has adopted and will maintain BMPs in five of the 10 areas, as checked below:

- ✓ Public Information and Education Programs
- ✓ Distribution System Audits, Leak Detection, and Repair
- ❑ Water-Efficient Landscape
- ✓ Toilets and Urinals
- ✓ Faucets and Showerheads
- ❑ Boiler/Steam Systems
- ✓ Single-Pass Cooling Systems
- ❑ Cooling Tower Systems
- ❑ Miscellaneous High Water-Using Processes
- ❑ Water Reuse and Recycling

Additional information related to each BMP area is provided in the following sections.

**Public Information and Education Programs (BMP #1)**

The Newport Laboratory promotes water conservation and awareness using the EPA laboratory "Every Drop Counts" water conservation poster series. Conservation posters are displayed in prominent locations within the laboratory. In addition, employees will be educated on water and other resource conservation topics though the implementation of laboratory EMS, which is being developed. The reduction of water consumption has been identified as an objective under the draft EMS. In view of this objective, the Facility Manager will maintain and promote water conservation awareness though e-mail and posting information.

**Distribution System Audits, Leak Detection, and Repair (BMP #2)**

A screening level system review was conducted in June 2004 to develop this plan, and known water uses account for greater than 90 percent of water consumption.

Facility staff are trained to report leaks and malfunctioning water using equipment to a facility maintenance help line. A service request is generated for each reported problem, which is completed by the facility O&M contractor. Service requests are tracked using an internet based work order management system through completion and close out. O&M contractor staff make a daily walk-through inspection of all mechanical spaces. Any problems or leaks identified are addressed immediately.

## Water-Efficient Landscape

The Newport Laboratory complex occupies approximately 3.2 acres on the east side of the HMSC campus. The laboratory site is made up of approximately 1 acre of buildings, and 2 acres of grounds, most of which is covered with natural vegetation. These grounds are not irrigated.

The main laboratory building has an inner courtyard and entry courtyard totaling approximately 0.2 acres. The courtyard areas are landscaped with native vegetation. The entry courtyard is equipped with a drip irrigation system which is operated 3 times per week on an independent timer system. The inner courtyard is equipped with both spray and drip irrigation. These irrigation systems are controlled by the building control system, and operate for 30 minutes every morning. The irrigation systems operate from approximately May to September each year. The inner courtyard also contains a fountain which is supplied with a small constant trickle of water during the summer months to make up for evaporation.

Best management practice status is not claimed in this area at this time, considering the concentrated application of irrigation water to the central courtyard. BMP status can be achieved by reviewing the irrigation needs of the plants in the courtyard, and supplying only the quantity of water necessary of plant health. The irrigation system should also be supplied with a rain or moisture sensor or other device to prevent irrigation when sufficient moisture is available from natural precipitation.

## Toilets and Urinals (BMP #3)

Construction of the laboratory was competed in 1990, prior to the implementation of current water-efficient sanitary fixture standards. Given the year of building construction, toilets are estimated to operate at 3.5 gallons per flush (gpf), rather than the current low-flow design standard of 1.6 gpf. Urinals were converted to a no-flush design in July 2004. A full inventory of sanitary fixtures is provided in Table 2.

Janitorial staff and employees are trained to report leaks or other maintenance problems to the facility maintenance help line, which are immediately corrected.

Given the conversion of urinals to a no-flush design, BMP credit is claimed in this area. Conversion of toilets to a low-flow design was evaluated, but is not being pursued at this time because the estimated 20 year payback is not considered cost effective.

## Table 2
## Sanitary Fixture Inventory

| Fixture | Quantity | Flow Rate |
|---|---|---|
| Toilets | 8 | 3.5 gpf |
| Urinals | 2 | no-flush |
| Lavatory Sinks | 7 | 2.2 gpm |
| Showers | 3 | 2.5 gpm |

**Faucets and Showerheads (BMP #4)**

Table 2 provides an inventory of lavatory faucets and showerheads. The faucets and showerheads were upgraded with water conserving flow restrictors in August 2004.

System pressure is maintained at 65 pounds per square inch, within the range recommended for optimum system performance.

Janitorial staff and employees are trained to report leaks or other maintenance problems to the facilities maintenance help line, which are immediately corrected.

**Boiler/Steam Systems**

Heat is supplied by electric heat pumps, no steam is utilized for building or domestic hot water heating. A small steam generator supplies a glassware washer and an autoclave. These units are used infrequently and condensate is not recovered. No BMP credit is claimed in this area.

**Single Pass-Cooling (BMP #5)**

The laboratory is equipped with an electric, air-cooled chiller that provides central closed-loop chilled water for almost all equipment cooling. However, the air compressor in the mechanical room is supplied with city water for single-pass cooling. This use is estimated to account for a significant portion of water consumed between April 2003 and March 2004, as recorded on Table 1. However, once this use was traced in March 2004, the water flow to the compressor was adjusted down to the minimum required to temper the compressed air to 75 °F. This use is checked daily by the O&M contractor and now runs at a few drops per minute since being adjusted in March 2004. Based on the primary use of closed loop cooling, and the careful control of single-pass cooling water applied to the air compressor, BMP credit is claimed in this area.

**Cooling Tower Systems**

Cooling water requirements are supplied by electric heat pumps; the laboratory is not equipped with a cooling tower. No BMP credit is claimed in this area.

### Miscellaneous High-Water Using Processes

De-ionized (DI) water for laboratory use is generated through a multi-step process consisting of cartridge filtration, carbon adsorption, and reverse osmosis (RO). Product water from the RO unit is used as feed water to the DI water recirculating loop. The RO unit rejects 2.7 gallons of water for every 1.3 gallons of product water. The DI water is circulated from a holding tank through an ion exchange bed and ultraviolet disinfection unit and out to the laboratories through a header system. The circulated water that goes unused is returned to the holding tank.

City water is mixed with seawater to control salinity for the science conducted in Laboratory L-24. In an experimental set-up just established, 2 liters per minute (0.54 gpm) continuous flow of city water is applied to the culture tanks in this room to control the salinity and temperature in the tanks. Headers for closed-loop cooling and heating water are available in this room and plans are in place to provide connections to these closed loops for tempering requirements. Once the closed loop tempering water is connected, city water will only be required for salinity control, which is expected to reduce the continuous flow to this laboratory. Note that this water use is not reflected in the water balance presented in Table 1, as this use began after the time period reflected by the data in the table.

Boats are washed down with garden hoses at a wash rack on the building exterior. Washing each boat is estimated to use 130 gallons of water. Boat use cycles with the seasons; approximately three boats per day are washed five days per week in the summer months and one boat per day is washed three days per week in the winter months.

No BMP credit is claimed in this area at this time.

### Water Reuse and Recycling

The laboratory is in the initial stages of evaluating options to collect and use captured rainwater. Potential options under consideration are to use rainwater to supplement the irrigation system, or as supplemental supply to the wash rack. No BMP credit is claimed in this area at this time, pending further development of these options.

## 7.0 DROUGHT CONTINGENCY PLAN

Newport is supplied with water primarily from the Big Creek Reservoir, with additional supply available through water rights to the Siletz River. Newport has not imposed mandatory water restrictions, nor has a drought emergency been declared in Lincoln County, in recent years. The City of Newport does not have an official water management plan specifically for droughts, but the Oregon Water Resources Department (WRD) coordinates with municipalities to implement water conservation or curtailment plans when drought emergencies are declared.

In the event that voluntary or mandatory water consumption reductions are instituted by the City of Newport, the Newport Laboratory will form a task force of facility and operating personnel to

identify and implement modifications to facility operations to achieve additional specified reductions in water consumption.

Oregon drought information resources are available at the WRD website:

http://www.wrd.state.or.us/drought_watch/

## 8.0 COMPREHENSIVE PLANNING

Consistent with the WED environmental management policy to consider the environment when making all planning, purchasing, and operating decisions, the Facilities Manager will ensure that water supply, wastewater generation, and water efficiency BMPs are taken into account during the initial stages of planning and design for any facility renovations or new construction. These factors will also be considered prior to the purchase and installation of any equipment that would measurably change facility water consumption.

## 9.0 OPPORTUNITIES FOR FURTHER WATER CONSERVATION

The WED Newport Laboratory is considering the following projects to improve measurement and achieve additional reductions in water use:

**1) Metering on make-up to closed loops.** Equipping the make-up supply lines to the heating and cooling closed loops with sub-meters, and routine monitoring of the metered flow to these systems, would provide an early warning of a leak or other potential problem. Portions of these loops are buried underground at the exterior of the building and hidden leaks have been a problem in the past. While there are no leak losses identified at this time, such meters would provide better operational control in the future.

**2) Irrigation application rate.** The laboratory will consult with its landscape contractor to establish a landscape irrigation rate at the minimum quantity needed for plant health. The irrigation controller will be equipped with a rain or moisture sensor to avoid watering when natural precipitation is sufficient to maintain plant health.

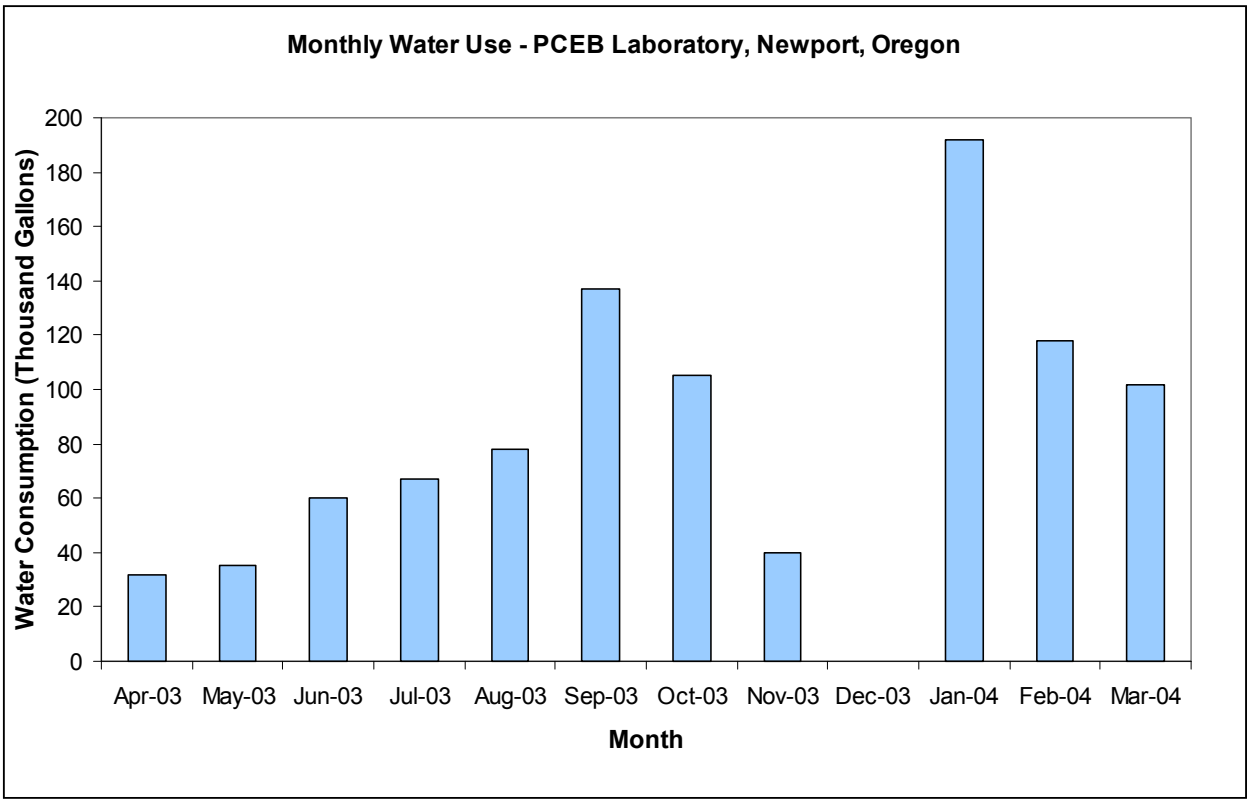
**3) Rainwater harvesting.** The laboratory will evaluate the feasibility of collecting storm water from roof drains in a cistern. Potential storm water reuse for landscape irrigation or boat washing will be examined.

# APPENDIX A
# WATER USE AND WATER BALANCE SUPPORTING CALCULATIONS

## PCEB Laboratory, Newport, Oregon

| Major Process | Annual Consumption (gallons) | Supporting Calculations |
|---|---|---|
| Air compressor once-through cooling | 260,000 | Engineering estimate based a assumed 0.5 gpm continuous flow rate. 0.5 gpm * 60 minutes/hr * 24 hr/day * 365 days/year = 262,800 gallons. Note that this flow was reduced to a drip flow rate in mid March 2004. |
| Sanitary | 250,000 | Engineering estimate based on 25 gallons per person per day and an average population of 40 people. 40 people * 25 gallons/person-day *250 days = 250,000 gallons. |
| Irrigation | 100,000 | Engineering estimate based on approximately 15 irrigation heads (sprayers or drip lines), assumed 1.5 gpm flow per head, 30 minutes per day of irrigation, and a 150 day irrigation season. 15 heads * 1.5 gpm/head * 30 minutes/day * 150 days = 101,250 gallons. |
| Boat washing | 50,000 | Engineering estimate based on 6.6 gpm flow rate (2 hoses full open), 20 minutes reported wash time per boat, and approximately 376 washdowns per year. 6.6 gpm * 20 * 376 = 49,632 gallons. |
| Dionized water | 23,000 | Based on estimated DI tank refill rate of 150 gallons, 3 times per week. 150 gallons * 3 times/week * 52 weeks = 23,400 gallons. |
| Reverse osmosis reject water | 49,000 | The RO system feeds the DI water tank. Reject water was observed to be generated at a 2.7 to 1.3 ratio to product water. 23,400 gallons * 2.7/1.3 = 48,600 gallons. |
| Miscellaneous process and other laboratory water | 234,000 | Calculated by difference from metered total. 966,000 - 260,000 - 250,000 - 100,000 - 50,000 - 23,000 - 49,000 = 234,000 gallons |
| TOTAL | 966,000 | From monthly meter readings. |

# Monthly Water Use Data




Monthly Water Use
1000 Gallons

| Month | Water Use |
|---|---|
| Apr-03 | 32 |
| May-03 | 35 |
| Jun-03 | 60 |
| Jul-03 | 67 |
| Aug-03 | 78 |
| Sep-03 | 137 |
| Oct-03 | 105 |
| Nov-03 | 40 |
| Dec-03 | 0* |
| Jan-04 | 192 |
| Feb-03 | 118 |
| Mar-03 | 102 |

*Missed meter reading. December use is included in January total.